

PAPERS READ.

NOTES ON THE FAMILY *BRACHYSCELIDÆ*, WITH
DESCRIPTIONS OF NEW SPECIES.

PART III.

BY WALTER W. FROGGATT, TECHNOLOGICAL MUSEUM, SYDNEY.

(Plates XVI.-XVII.)

This Part of my notes consists of the description of a new and very remarkable species of *Brachyscelis*, received from Cobar, N.S.W., by Mr. J. H. Maiden, to whom I am indebted for the opportunity of adding it to our list of gall-making coccids. The rest of the paper contains descriptions of a number of new coccids all belonging to the genus *Opisthoscelis*. Wherever the Eucalypts grow these galls are found, and no doubt, when collections are made from all parts of Australia, this group of the Coccidæ will be greatly increased. The difficulty has not been to find galls, but to decide which are distinct species, for in some the galls are very variable, and where one species attacks several different species of Eucalypts they often differ so much that it is only by carefully examining the female coccids that one can define the specific characters. While in the genus *Brachyscelis* the female and male galls all have the opening at the apex, in the genus *Opisthoscelis* it may be either at the apex or at the base on the underside of the leaf; all the species (with one exception) described herein have only the long posterior pair of legs, with an immense prolongation of the tarsal joint, but it is not always quite truncate at the tip as in the typical *O. subrotunda*; the coccid is more elongate, with the tail more rounded, while in the last stage of the female's existence, in several of these she is so solidly attached to the base of the gall that one can only remove

her in fragments. The anal appendages are either formed by two or four incurved or straight spines, sometimes in an anal ring, but more frequently this ring is absent; the spines are not always visible in all the species, but I think that they are always present in some stage of the development of every species of *Opisthoscelis*.

The larva is not, like *O. subrotunda*, finely serrate all round the outer margins, but only carrying a fringe of very short hairs or bristles on the front of the head, with a single short bristle on either side of each abdominal segment; while in four species I have examined they are generally rather broader and stouter, the eyes close behind the antennæ and the thorax swelling out slightly behind the eyes. The larva of *Brachyscelis* is not lobed in the centre of the head, and the outer margins are not serrate but fringed right round with flat feather-like cilia, close together but not touching, and truncate at the extremity, which give the larva a very beautiful appearance under the microscope.

While the true *Brachyscelidæ* are confined to the Eucalypts, *Spharæococcus* is found upon *Melaleuca* and *Leptospermum*. I have had much pleasure in handing over to Mr. Maskell several species of the latter genus that I have collected about Sydney, which will be described in the next part of the Transactions of the New Zealand Institute.

The coccids belonging to the genera *Cylindrococcus* and *Frenchia*, both formed by Maskell, are peculiar to the Casuarinæ, so at the present time the food-plants of the chief groups of our gall-making coccids are well defined.

BRACHYSCELIS UMBELLATA, n.sp. (Pl. XVI. figs. 1-2).

♀. Gall bright green, 12 lines long, $1\frac{1}{2}$ lines broad at base, 5 lines in diameter at apical rim, cylindrical, elongate, funnel-shaped, apex brown, rough, and warty, the rim sometimes curving over in irregular lumps, convex, apical orifice elongate-oval, very small, situated at the tip of a spine-like projection which springs from centre of depression but is level with outer margins of apical walls; walls of chamber soft and spongy, inner or woody shell

hard, of medium thickness, chamber very elongate, occupying the whole of central portion of gall and tapering to a point at each end.

♀. Coccid bright orange-yellow, with the central portion of head segment on upper side vitreous. Length 6 lines, diameter at widest 2 lines. Upper side: head segment rounded in front, rather straighter behind, covered with short stout hairs, in the centre a circular depression containing a cluster of short fine hairs, an elongate oval ring of ferruginous round depressed spots, six in front, four behind; thoracic segments regular, distinct, covered with scattered fine short bristles, with much longer hairs on the apical margins, much more numerous on the last segment. Abdominal segments all clothed with long scattered white hairs, 1st segment with several short ferruginous spines in centre of back, 2nd to 4th segments with a double irregular row or patch of similar spines, 5th and 6th with a much thicker mass of stouter and longer spines; base of anal appendages ferruginous, covered with similar spines and scattered long hairs; anal appendages ferruginous at base, the rest black, long, slender, cylindrical, rugose, hairy, and lying close to each other from base to apex, truncate and slightly opened out at tip. Underside: a pair of black marks on either side of frontal fold, which look like eye spots; lobe bearing forelegs rounded in front and behind. Forelegs short and stout, ochreous; tibiae stout, curved; tarsal claws black at tips, pointed and curved inwards; the middle and hind legs rather longer than forelegs. A rounded peg-like appendage, at the tip of which is the mouth, between the front pair of legs, all the underside and legs smooth and shining, with a few short scattered hairs all over, showing long and thick on the outer edges, anal segment hairy, with a patch of fine bright golden-yellow hairs at base of anal appendages.

It will be seen by the above description that this coccid differs very considerably from any of the previously described species, the curious depression and surrounding ring of spots being quite unique, while the supposed eye spots and the distinct projecting mouth are very remarkable. The coccid is very active, moving

backwards and forwards with great ease in its long chamber ; when laid on its back under the lens it is seen to turn the abdominal segments straight up and remain in this position all the time, resting only on the head and thoracic segments. This coccid seems to secrete hardly any of the floury matter exuded so plentifully by most species.

Hab.—Cobar, N.S.W. On *Eucalyptus* sp. (Mr. A. Roxburgh).

OPISTHOSCELIS VERRUCULA, n.sp. (Pl. XVII. figs. 3-5).

♀. Galls rounded green pea-shaped excrescences, slightly corrugated on the sides, sometimes nipple-shaped, growing singly or in scattered groups of two or three on the same leaf as the male galls ; opening small and irregular on the underside of leaf ; chamber an irregular oval cavity with wall of chamber thickest on summit ; height $3\frac{1}{2}$ lines, diameter $2\frac{1}{2}$ lines.

♀. Coccid (first stage) flattish, elongate-oval, tapering towards the tip of abdomen, pale salmon pink, antennæ stout, short, conical, apparently 3-jointed, inserted in front of the eyes, the latter round and black. Midlegs rudimentary, but no signs of forelegs ; posterior pair with stout femora and tibiæ, and short blunt tarsal joint showing over sides of insect ; anal ring and four incurved spines on the tip of the anal segment.

♀. Coccid (second stage) brownish-yellow, head and thoracic segments large, rounded ; abdominal segments distinct, small and tapering to the tip ; coccid attached to the roof of the gall by the mouth (which forms a rounded mass when detached), lying across the chamber, and not downwards as in *Brachyscelis*. No traces of eyes, forelegs, or antennæ ; the second or middle pair of legs represented by two slight pointed excrescences ; hind legs well developed, femora large, stout, tibia rather slender, tarsal joint cylindrical, slender, nearly as long as the whole coccid, truncate at tip ; thoracic segments large ; abdominal segments small, tapering to the tip, which is rounded ; anal segment carrying an anal ring with four curved spines forming the tail.

♀. Coccid (adult) bright red ; upper side flat, circular, slightly concave, covered with white down ; underside of body wrinkled ;

legs broken short, or with the tarsal joint withered up or wanting. The gall at this stage is dome-shaped above, with the basal orifice surrounded with a raised ring.

♂. Galls $1\frac{1}{2}$ to 2 lines high, produced upon the leaf in wart-like excrescences, broadest at base, tapering to a truncate tip, with a key-hole or slit-like apical orifice, sometimes in clusters of two or three, but often on the younger leaves, forming the whole leaf into a solid fleshy mass of galls all confluent at the base, but opening out individually at the apex, tinted at the tips with pale pink and covered with a whitish bloom.

♂. Coccid pale red, with white opaline wings; enveloped in a larval sac before emergence. Antennæ long, tubular, composed of nine joints; 1st stout, truncate; 2nd very short, obconical; 3rd of about the same length but irregular in shape and rounded at base and apex; 4th-8th of a uniform length, constricted and rounded at apex; 9th about half the length, with a blunted tip. Head and antennæ covered with long hairs; dorsal eyes round and prominent, ventral eyes very close together; front of head square, rounded behind the eyes. Thorax smooth, shining, round, broadest in front; legs long, slender; tarsi simple; underside of thorax and legs covered with short hairs; wings large, granulated, showing rich opaline reflections; the longitudinal vein well back from the margin of the wing; the discoidal branch long, stout, rounded, forming an elongate oval in the centre of the wing; abdomen with first joint short, almost as broad at base as at thorax, the others tapering towards the apex, each irregularly corrugated; 2nd broad and stout; 3rd and 4th shorter; the rest longer and slender, tapering to the tip, the last forming a sharp lance-like tip, readily moved backwards and forwards when the insect is alive; the last two joints with the movable tip pale yellow.

Hab.—Napoleon Reef, near Bathurst, N.S.W., on *Eucalyptus* sp. (W. S. C. Ross and W. W. Froggatt). In consequence of the larger trees in the vicinity of the mine having been cut down for firewood, there was a fine growth of young foliage from the stumps admirably adapted for such insect attacks.

OPISTHOSCELIS MASKELLI, n.sp. (Pl. xvii. figs. 6-9).

♀. Gall 6 lines high, diameter 4 lines ; basal portion dull green, apical portion brown ; solid, broad, and squat at the base, cylindrical for the first two-thirds, then sharply constricted, often into a distinct rim, from which a conical pyriform brown cap springs, formed of several concentric rings ending in a truncate tip, with the apical orifice in the centre ; orifice a very narrow elongate slit ; chamber flask-shaped, walls very thick at base, thinning out towards apex, smooth and shining inside.

The immature galls very much more elongate, flask-shaped, narrow at base, swelling out in the centre and coming to a slender tip, pale green, with the apex often tinged with pink or brown : on the young branchlets, leaf-stalks, and sometimes upon the midrib of the leaf, often singly, sometimes covering all the foliage of the tree.

This gall is very variable in form, but the above description is of the typical and usual shape, the others being only local variations.

♀. Larva pale pink to salmon colour, filling up the cavity in mature galls at the apical opening. Head lobed in centre with a fine fringe of hairs between antennæ ; antennæ short and stout, consisting of four (?) joints and terminating with several setæ, one much longer than the others ; eyes black, well back in the head behind the base of the antennæ ; body elongate-oval, pointed towards the tip of the abdomen, segments distinct, legs stout, a little stouter and more shield-shaped than in the larvæ of *O. subrotunda*.

♀. Coccid (first stage) yellow, 2 lines long ; flat on the upper side, elongate, rounded at the top, tapering to the tip, attached to the bottom of the gall by the mouth, which is situated in the centre of the upper portion of the thoracic fold, and drawing out considerably when detached, but retracted when released ; no signs of eyes or antennæ ; fore and middle pairs of legs wanting, hind pair reddish-yellow, femora short, stout, tibia slender, tarsi long, slender, often as long as the whole coccid, truncate at the

tip. Abdominal segments small, distinct, rounded on the outer margins and tapering towards the apex, anal tail short, rounded.

♀. Coccid (second stage): mature coccid bluish-grey, covered with whitish dust on the back; 3 lines long, 2 lines in diameter; oval, convex on the upper side, all the underside attached to the floor of the gall, so closely that it is impossible to detach it without injuring the coccid; abdominal segments much reduced and curved upwards; legs black, distinct; tibiæ and tarsi short, the tarsal joint slender, filiform, curling over the tip of the abdomen and pointing upward towards the apical orifice, the tail not visible. At this stage the galls generally contain numbers of live larvæ.

♂. Galls 2 lines high; reddish-brown, broad at the base, tapering towards the tip, tubular, the rim at the apex produced into five little teeth surrounding the apical orifice, which is circular; growing upon the leaves singly, sometimes in immense numbers, covering both sides of the leaves.

♂. Coccid reddish-pink, dorsal eyes large, black, globular, standing out, wide apart, just behind the antennæ; the latter short, about thrice the width of the head, consisting of nine indistinct irregular joints, rather short, covered with scattered white hairs; thorax broad, rounded in front; abdomen bright red, the segments constricted at the base, tapering towards the tip, terminating in a lance-like pointed style; legs long, slender, covered with long white hairs, thighs short, tarsal joints simple; wings large, hyaline.

This is a very distinct and rather common gall in New South Wales. I have taken it at Maitland, Cooma, Newcastle, and from a dozen localities within a radius of twenty miles of Sydney. A constant locality is Flemington on *Eucalyptus siderophloia*, the large-leaved ironbark; full grown in September.

I have great pleasure in dedicating this fine species to W. M. Maskell, Esq., of New Zealand.

OPISTHOSCELIS SPINOSA, n.sp. (Pl. XVI. figs. 10-12).

♀. Gall brown, 3 lines high, 3 lines in diameter at the base; broad and round at the base, coming to a sharp thorn-like tip,

in which is situated the minute circular apical orifice ; walls of chamber thin ; always formed upon the leaves, generally covering them with isolated galls, but sometimes so close together that they abort the leaves.

♀. Coccid (first stage) bright yellow, smooth, shining, elongate, top-shaped, with the anal segments tapering to a point ; attached by the mouth to the floor of the gall chamber ; fore and middle pairs of legs rudimentary, hind pair long and slender.

♀. Coccid (second stage) reddish-yellow, covered on the upper side with curly white hairs, interspersed with longer straighter hairs forming a fine fringe round the outer margin of the coccid ; segments rounded, well defined, fringed on the lower margins with close long hairs, and forming a rounded tail at the tip of abdomen ; underside rounded at the head, the outer portion of head and thoracic segments forming an overlapping rim ; traces of rudimentary antennæ, fore and middle legs ; hind legs stout, distinct, dull yellow blotched with black, tarsi excessively elongated, slender, cylindrical, truncate at the tip, and often twice the length of the coccid.

♀. Mature coccid fixed on the underside to the base of the gall in a similar manner to *O. Maskelli*, with the long tarsi curled up over its back and almost reaching to the extremity of the chamber.

♂. Galls green, $\frac{1}{2}$ line high, 2 lines in diameter ; rounded excrescences irregularly wrinkled on the summit, with an irregularly rounded basal orifice situated in a brownish wart on the underside of the leaf ; galls clustered together on a leaf by themselves, but sometimes scattered about among the female galls.

♂. Coccid salmon-pink ; head square in front, rounded behind, broader than long ; dorsal eyes globular ; antennæ long and stout ; covered with long plumose hairs, the 1st joint short, cylindrical ; 2nd obconical, short ; 3rd cylindrical, longest ; 4th-8th of uniform length ; 9th short, rounded at tip : thorax broad, marked with reddish lines ; legs very hairy ; wings large, white, semitransparent, with a granulated appearance, the transverse and discoidal

nervures broad well into the wing, with the latter turning upward towards the tip; abdomen with the first four segments stout, cylindrical; 5th-8th long, slender, tapering downwards; 9th long, slender, and truncate at the tip, from which springs out a tuft of slender white filaments, forming a very handsome brush.

Hab.—Plentiful in several localities about Sydney; common at Flemington on *E. siderophloia* in September (W. W. Froggatt).

OPISTHOSCELIS PISIFORMIS, n.sp. (Pl. xvii. figs. 13-14).

♀. Galls green, tinged with reddish-brown; soft globular excrescences 2 lines in diameter covering the leaves; basal orifice on the underside of the leaf, keyhole-shaped, in the centre of a raised brown button-like wart; chamber spherical, walls thin, the coccid lying across the roof lightly attached by the mouth to the gall.

Larva not differing from previously described species, of which *O. Maskelli* may be taken as the type.

♀. Coccid (first stage) pale yellow, almost a regular oval, looking very much like a small seed; with round dorsal eyes; underside short, conical; antennæ, fore and middle legs short, rudimentary, semitransparent; hind legs much more produced, with the tarsal joint long and cylindrical.

♀. Coccid (second stage) salmon-pink; head and thorax rounded, with the head lobe hanging forward, oval, with a small dark spot above it, much wrinkled; abdomen elongate, long and slender, the last segment forming a small conical tail, on the upper side of which are two short recurved reddish spines tipped with black; all covered on the upper side with long close hairs, forming a fringe on outer margins and also fringing the segments of the underside at the apical margins; legs long and slender, femora short and stout, tibiæ slender, of uniform thickness to the tip, the tarsal joint very long, slender and filiform.

♂. Galls conical, 2 lines high, brown; growing upon the leaves and young twigs, broadest at the base, tapering to the apex, which is truncate, with an irregular oval aperture; immature males in these cells pale red, swathed in thick white felty sacs.

♂. Unknown.

Hab.—Bathurst on *Eucalyptus melliodora*; Manly on *E. robusta*; Thornleigh on *E. piperita*; Sutherland on *E. resinifera* (Froggatt).

This is a very variable species, the galls also often differing much in shape and size, but I believe these are only local varieties of the same thing.

OPISTHOSCELIS MAMMULARIS, n.sp. (Pl. XVI. figs. 15-16).

♀. Gall $3\frac{1}{2}$ lines high, 2 lines in diameter at the base; red to reddish-brown, tinged with green, broad at the base, constricted about two-thirds up and swelling out into a rounded nipple, upper portion of gall solid, walls thin on the sides, chamber small and irregular, basal orifice on underside of leaf, very irregular, on a reddish warty pustule.

♀. Coccid dull yellow, head and thoracic segments large, rounded, the abdominal segments very small and narrow, all covered with long curly white hairs, with other shorter straight ones forming a fringe round the anal segment, tip of anal segment bearing two small reddish-brown spines curved backwards, forming a tail; legs rather short.

♀. Coccid (mature) rounded, wrinkled, greyish-brown, tapering towards the anal tip: hind legs pale yellow; femora short, rounded; tibiæ long, stoutest at the base; tarsal joint long, filiform, three times as long as tibiæ, the apex not quite truncate as in the others, but coming to a point.

♂. Galls green, forming slightly raised lumps about 1 line in diameter, generally three or four galls forming in clusters, on the underside of the leaf forming conical funnel-shaped excrescences broadest at the base, truncate at the tip; orifice large, the inner margins of the opening crenulated and irregular.

♂. Coccid unknown.

Hab.—Bendigo, Vic., on *Eucalyptus* sp. (Froggatt).

OPISTHOSCELIS FIBULARIS, n.sp. (Pl. XVI. figs. 17-21).

♀. Gall brown, pyriform, growing upon the leaves, often in great numbers, 2 lines high, 2 lines in diameter, the base forming

a circular ring, from which stands out a conical tapering thorn, slightly constricted below the apex, which is truncate; apical orifice a transverse slit-like opening, with the side of the tip curling downwards on either side like a small lip; walls of gall thin; female coccid slightly attached to the floor of the chamber.

♀. Coccid dull pale yellow; head and thoracic segments very round with the abdominal ones narrow, small and tapering to the anal extremity, covered with fine hairs thickly fringing the margins of the segments; underside flat; centre of head segment containing two irregular rounded black patches, which are joined on the inner edges to each other; in the front of each a small black tubercle like an aborted antenna, on the lower or apical portion of central or head segment, and just above the legs, is a small fold looking like a sketch of an anchor; legs long and slender, femora generally black, tibiae short, tarsal joint slender, cylindrical, slightly tapered towards the tip, which is not truncate but bluntly rounded; abdominal segment closely covered with short hairs.

♂. Galls with the female galls on the upper side of the leaves, the base forming a red wart about $\frac{1}{2}$ a line in length on underside of leaf, 1 line high, $1\frac{1}{2}$ lines in diameter at base, broadest at base, tapering towards apex, apical orifice an elongate oval on upper side of leaf.

Hab.—Bendigo, on leaves of *Eucalyptus* sp. in September; Bathurst in February (Froggatt).

OPISTHOSCELIS MACULATA, n.sp. (Pl. xvii. figs. 22-23).

♀. Galls brown, 3 lines high, 2 lines in diameter at the base, $\frac{1}{2}$ a line in diameter at the apex; pyriform, broad at base, tapering very slightly about two-thirds of height, then constricted into a conical point; apical orifice narrow, slit-like, with the lip on either side black, rugose and slightly turned back; base of gall thick; walls of chamber brown, shining, of medium thickness: upon the slender twigs and leaf-stalks sometimes singly but other times close together in rows.

♀. Coccid ochreous-yellow, shining and glassy, attached by the whole of the underside to the floor of the chamber, almost oval; segmental divisions distinct, with an impressed spot on either side of the first four segments; the abdominal segments small, tapering to the tail, fringed with scattered white hairs, the tip truncate, the tail hidden; tarsal joint of hind legs long and slender, tapering slightly towards the tip.

♂. Galls reddish-brown to black, $1\frac{1}{2}$ lines high, broadest at the base, tubular, tapering towards the apex; apical orifice irregular, crenulated, the rim forming a number of irregular teeth; growing upon the leaves, and often in such numbers that the leaf is quite aborted.

The female galls are somewhat like a small variety of *O. Maskelli* at first sight, but the mature female (the only stage obtained) is quite distinct, while the galls, which are very plentiful in the Whipstick Scrub, do not vary in the slightest.

Hab.—Bendigo, Vic., on *E. leucoxyton* and on *E. gracilis* in August (Froggatt).

OPISTHOSCELIS SERRATA, n.sp. (Pl. XVII. figs. 24-26).

♀. Gall green tinged with yellow, spherical, 3 lines in diameter, constricted at the base; formed upon the leaves, generally singly but sometimes in groups of two or three; basal orifice on underside of leaf an irregular slit with rugose warty edges; gall soft and spongy, with the chamber large.

♀. Coccid pale yellow, elongate, rounded; head rounded in front and rising up in the middle between the eyes in a crescent; dorsal eyes globular, black, not on the edge but placed well in the side of head; outer margins of the thoracic and abdominal segments on upper side serrate, with an irregular row of fleshy teeth right round to the anal tip, the body swelling out underneath them so that they appear not to be the marginal edges until closely examined; abdominal segments lightly fringed with hairs; underside flattish. Antennæ ferruginous, springing out of the first fold, formed of four stout irregular cylindrical joints, the last rounded at the tip and surrounded with scattered hairs; head

and thoracic segments very wrinkled, a deep angular brownish cavity is evidently the mouth, which is retracted when the coccid is removed from the gall; when in the gall it is attached to the roof of the chamber; short, cylindrical, 2-jointed fore and middle legs; hind legs ferruginous, femora short and stout, tibiæ stout, tarsal joint about twice the length of femora, tapering slightly to the tip, which is rather rounded and not truncate at the apex.

Hab.—Bendigo, Vic., on *Eucalyptus* sp. (Froggatt).

The galls of this species are very like those of *O. subrotunda*, but the remarkable well-developed antennæ and curious serrate edges of the segments make it very distinct from any other species I have examined.

EXPLANATION OF PLATES.

Brachyscelis umbellata, n.sp.

- Fig. 1 (Pl. XVI.)—Female galls.
 Fig. 2 (Pl. XVI.)—Female coccid, ventral view.

Opisthoscelis verrucula, n.sp.

- Fig. 3 (Pl. XVII.)—Male and female galls.
 Fig. 4 (Pl. XVII.)—Female coccid, ventral view.
 Fig. 5 (Pl. XVII.)—Male coccid, ventral view.

O. Maskelli, n.sp.

- Fig. 6 (Pl. XVII.)—Male and female galls.
 Fig. 7 (Pl. XVII.)—Larva.
 Fig. 8 (Pl. XVII.)—Female coccid, in first stage.
 Fig. 9 (Pl. XVII.)—Female coccid, full grown.

O. spinosa, n.sp.

- Fig. 10 (Pl. XVI.)—Male and female galls.
 Fig. 11 (Pl. XVI.)—Female coccid, ventral view.
 Fig. 12 (Pl. XVI.)—Male coccid, ventral view.

O. pisiformis, n.sp.

- Fig. 13 (Pl. XVII.)—Male and female galls.
 Fig. 14 (Pl. XVII.)—Female coccid, dorsal view.

O. mammularis, n.sp.

Fig. 15 (Pl. XVI.) —Male and female galls.

Fig. 16 (Pl. XVI.) —Female coccid, dorsal view.

O. fibularis, n.sp.

Fig. 17 (Pl. XVI.) —Male and female galls.

Fig. 18 (Pl. XVI.) —Female coccid, in first stage.

Fig. 19 (Pl. XVI.) —Female, in second stage.

Fig. 20 (Pl. XVI.) —Female, in third stage.

Fig. 21 (Pl. XVI.) —Larva.

O. maculata, n.sp.

Fig. 22 (Pl. XVII.) —Male and female galls.

Fig. 23 (Pl. XVII.) —Female coccid, full grown.

O. serrata, n.sp.

Fig. 24 (Pl. XVII.) —Female galls.

Fig. 25 (Pl. XVII.) —Female coccid, ventral view.

Fig. 26 (Pl. XVII.) —Female coccid, dorsal view.